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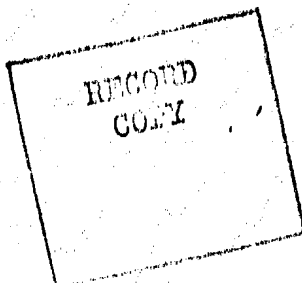
UNCLASSIFIED- INFORMATION ON SOVIET  
BLOC INTERNATIONAL GEOPHYSICAL COOPERATION  
- 1960

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**INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION - 1960**

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INFORMATION ON INTERNATIONAL GEOPHYSICAL COOPERATION

SOVIET-BLOC ACTIVITIES

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I. GENERAL

Three New Books on Radio Astronomy, Lunar Studies, and Oceanography

Radioastronomiya (Radio Astronomy). Annotated bibliographic index of Soviet and foreign literature. 1932-1958.

Sector of the Network of Special Libraries. Library of the Physics Institute, imeni P. N. Lebedev. Moscow, 1960, 216 pages.

Katalog i skhematiceskaya karta izbrannykh lunnykh ob'yektov dlya polnoluniya (Catalogue and Schematic Map of Selected Lunar Objects for a Full Moon).

Astronomical Council. Moscow, 1960, 30 pages, 1 enclosure.

Trudy Instituta okeanologii. T. XXXIV. Biologicheskiye issledovaniya morya (bentos) (Works of the Institute of Oceanology. Vol. XXXIV. Marine Biological Research (benthos)).

Moscow, 1960, 156 pages.

("New Books"; Publishing House of the Academy of Sciences USSR; Moscow, Vestnik Akademii Nauk SSSR, No 9, 1960, pp 137-138)

## II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

### Academy of Sciences Report Provides 5,000-Word Summary of Recent Soviet Exploits

A complete and well-balanced 10-page article recently appearing in the authoritative Vestnik Akademii Nauk SSSR discusses the most recent launchings of Soviet rockets and spaceships. Although nothing new is reported in this lengthy presentation, this fact-laden article has the merit of bringing into one paper a wealth of material which has appeared piecemeal in a wide range of Soviet publications over a period of some months. ("Space Ships in Earth Satellite Orbits," by Professor G. B. Petrovich, Vestnik Akademii Nauk SSSR, No. 9, 1960, pp. 3-12)

### First Lady-Astronaut ?

CPYRGHT "One of the most brilliant successors to the Soviet scientist, Tsiolkovskiy, is Alla Masevich. Still under 40 years of age, Alla's talent and knowledge have won for her the very highest position. She is a professor in the department of astronomy at Moscow University and deputy chairman of the Astronomical Council of the Soviet Academy of Sciences. It is even possible that she will be the first woman to go into space." ("Will She be the First?"; Budapest, Kepes Ujsag, Vol. 1, No. 1, 8 October, p. 10)

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## III. UPPER ATMOSPHERE

Measurement of the Electron Concentration in the Ionosphere -- A Full Translation

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The purpose of this brief paper is the exposition of one of the methods of measuring the electron concentration in the ionosphere. This method was used during launchings of geophysical rockets by the Academy of Sciences of the USSR to heights of 450 km or more. The paper will also set forth results received from the employment of this method during the launching of 27 August 1958. The method is based on observations of the Faraday effect. Measurements were accomplished by means of terrestrial observations of rotation of the polarization plane of radio waves emitted from vertically launched rockets stabilized relative to the three possible axes of rotation.

It is not difficult to find from formulas for the theory of propagation of radio waves in the ionosphere (with the Earth's magnetic field taken into consideration [1]), that for rather high frequencies (in which we may ignore the absorption of radio waves and consider the refractive index for right- and left-rotating components as close to unity)

$$\theta = \frac{e^3}{2\pi c^2 m^2} \frac{1}{f^2} \int_{L_1}^{L_2} H_L N dl. \quad (1)$$

Here  $\theta$  -- the angle of rotation of the polarization plane during the passage of radio waves along a ray of the distance  $L_2-L_1$  for an arbitrary direction of propagation of radio waves relative to the magnetic field;  $e$  and  $m$  -- the charge and mass of the electron;  $H_L$  -- the component of the magnetic field along the direction of propagation;  $N$  -- electron concentration. All of the units in (1) and thereafter are in the Gaussian system of units.

From (1) it follows that if  $\theta = \pi$ , then, considering the value  $H_L$  to be known and unchanging along the ray  $L_2-L_1$ , it is possible to write the mean electron concentration in the section under examination as

$$N_{sr} = \frac{2\pi^2 c^2 m^2}{e^3} \frac{f^2}{L_2 - L_1} \frac{1}{H_L} \quad (2)$$

By use of formula (2) it is easy to determine the vertical distribution of electron concentration in the ionosphere during vertical launchings of rockets completely stabilized in free flight. For this purpose it is sufficient to receive radio waves of a quite high frequency on the Earth on an antenna with linear polarization near the

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point where the rocket is launched; these radio waves will be emitted from the vertically launched rocket by means of a linearly polarized antenna. The amplitudes of the signals received are recorded. Since the coordinates of the rocket are known for each moment of time in flight, by knowing the time in which the polarization plane of the received signals turned by  $\pi$  (from one amplitude minimum to the next), it is possible to determine  $L_2 - L_1$ ; by knowing  $H_L$ , to find  $N_{sr}$  (mean) in this section of the rocket trajectory.

If the rocket is not stabilized in flight, the measurements of rotation of the polarization plane of the radio waves of one frequency cannot be used for measurement of electron concentration. In this case, for distinguishing the rotation of the polarization plane of radio waves created by the ionosphere from rotation caused by the turning of transmitting antennas, it is necessary to receive radio waves of at least two different frequencies and the processing of the results becomes extremely difficult.

In the vertical launchings of the rockets of the Academy of Sciences of the USSR, stabilized relative to the three possible axes of rotation, the rockets carried radio transmitters emitting coherent linearly polarized radio waves with frequencies of 24, 48 and 144 mc [2]. The reception of these radio waves was accomplished near the rocket launching point by horizontal antennas with two mutually perpendicular linear polarizations; the signals received by the antenna of each polarization travelled to the input of the individual receiver. The voltages at the input of each receiver were recorded.

The rotations of the polarization planes of all the received radio waves were observed during the flights of the rockets. The maximum values of the signals in the antennas with one polarization corresponded to the minimum (zero) signals in antennas with perpendicular polarization. Figure 1 shows changes in the levels of the received signals in one of the sections of the trajectory. The graphs clearly show the relationship  $\theta = \frac{1}{f^2}$  (in accordance with (1)), not

leaving any doubt that the recorded variations were caused by the Faraday effect.

Using data from vertical launchings of the indicated rockets, determinations were made of the mean electron concentrations in the intervals of height covered by the rockets, corresponding to the rotation of the polarization plane of the radio waves by the angle  $\theta = \pi$ . Formula (2) was used for this purpose, in which the value for the vertical component of the geomagnetic field  $H_z$  is substituted in accordance with existing data on the values of the intensity of the magnetic field and magnetic declination in the region where the rocket was launched.

Figure 2 shows the vertical distribution of electron concentration in the ionosphere  $N_{sr}(H)$ , received by the indicated method from data resulting from the launching of the Academy of Sciences rocket

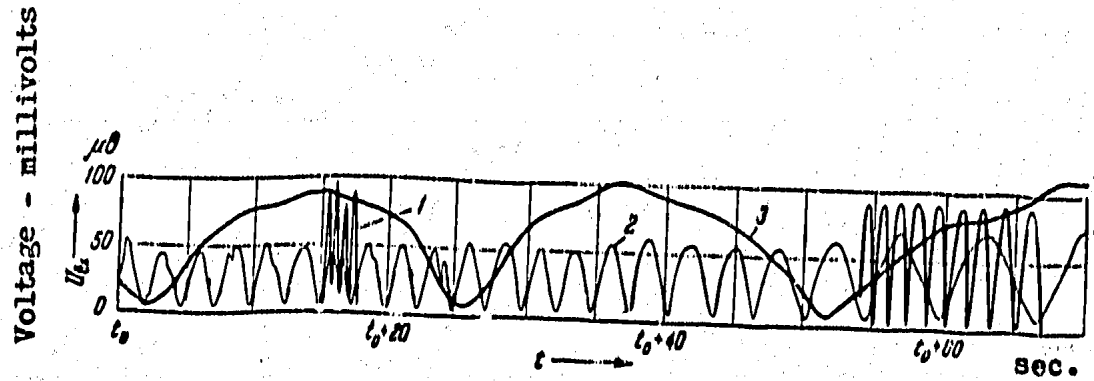


Figure 1. Section of a graph showing the level of signals with frequencies of:  $f=24$  megacycles (1), 48 megacycles (2), and 144 megacycles (3) which were received during the flight of the 27 August 1958 rocket (the curve for the 24 megacycle signal is not fully reproduced)

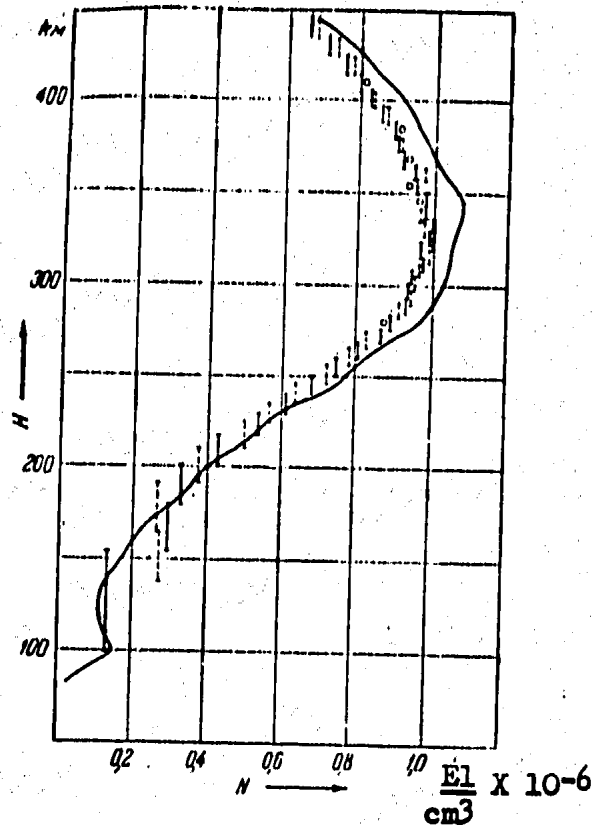


Figure 2. The relationship  $N_{cp}(H)$ , obtained 27 August 1958. The length of the vertical lines correspond to the intervals of neutralization according to altitude. The solid lines are constructed according to practically identical data obtained at two receiving points and the dotted lines, according to the data obtained at a third point. The round dots indicate the agreement of values for all three points. The curve, which was obtained from simultaneous measurements of the dispersion of radiowaves with frequencies of 48 and 144 megacycles (2) is presented for comparison.

on 27 August 1958 in the middle latitudes of the European part of the USSR. The launching got under way at 0806 hours. Figure 2 was drawn by using the results of recording of the levels of signals with a frequency of 48 mc.

A comparison of the vertical distribution of electron concentration received during the launching of the Academy of Sciences rocket of 21 February 1958 [2] with the distribution received on 27 August 1958, shows a conspicuous difference between them. In the second case the decrease with height of the concentration of electrons above the maximum of the F-layer was substantially slower.

#### Literature

- [1] Shchukin, A. N., Physical Principles of the Propagation of Radio Waves in the Ionosphere. Moscow, 1940.
- [2] Gringaus, K. I., Doklady Akademii Nauk SSSR, 120, No. 6, 1958, p. 1934.

("Measurement of the Electron Concentration in the Ionosphere by Rotation of the Polarization Plane of Radio Waves Emitted from Rockets," by K. I. Gringaus and V. A. Rudakov, Doklady Akademii Nauk SSSR, 1960, Vol. 132, No. 6, pp. 1311-1313)

#### Causes for Irregular Movements of Ionization Clouds Associated with Auroras

A. P. Nikol'skiy, of the Arctic and Antarctic Institute, is the author of a well-documented four-page article which recently appeared in the Reports of the Academy of Sciences of the USSR on the subject headlined above. His paper draws extensively on the work done by Hines, Kaiser and Bullough, Lyon and Cavadas, Störmer, Akasofu and others. ("On Possible Causes of Irregular Movements of Ionization Clouds Associated with Auroras," by A. P. Nikol'skiy, Doklady Akademii Nauk SSSR, Vol. 134, No. 2, pp. 341-344)

#### IV. METEOROLOGY

##### Soviet Jet Bomber Converted into Flying Aerological Laboratory

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Tashkent. 12 October. (By telephone.) An "IL-28" jet bomber has been delivered to the Uzbek Administration of the Civil Air Fleet. The armament has been removed from the aircraft, the bomb rack has been eliminated and the machinegunner's compartment in the tail of the aircraft has been transformed into an aerological laboratory.

In a conversation with the correspondent of "Izvestiya," the Chief of the Uzbek Administration of the Civil Air Fleet, A. Gazinazarov, stated as follows:

"The IL-28 will go aloft several times daily to great altitudes. Precise instruments will make it possible to collect data concerning the velocity and direction of the wind, air pressure -- in short, all the data needed for safe flights by passenger aircraft."

"The pilots, navigators and aerologists for the aircraft are officers and noncommissioned officers demobilized from the Soviet Army -- Fridrikh Zhigalov, Ivan Bogdanov, Vasilii Korshunov, Petr Sychov, Vladimir Selifanov and Petr Kondaurov."

("Bombers Remodeled into Aerological Laboratories," Izvestiya, 13 October 1960, p. 4) CPYRGH

##### A Method of Approximations for Reduction of Air Pressure to Sea Level

An article recently published in the Izvestiya of the Academy of Sciences of the Armenian SSR proposes a new idea for the drawing up of special tables to be used in the reduction of air pressure to sea level. It is based on the method of approximations. The author believes that the method has two superior features: (1) it can easily be mastered by novices, and (2) there is a minimum number of tables. The 4-page article thoroughly explains the method and provides all the formulas needed for derivation of the tables. The tables are suited for use at meteorological stations situated in mountainous regions at elevations greater than 500 m. ("The Reduction of Air Pressure to Sea Level by the Method of Approximations," by R. A. Movsesyan, Izvestiya Akademii Nauk Armyanskoy SSR, Seriya Tekhnicheskikh Nauk, XIII, No. 3, 1960, pp. 55-58)

## V. OCEANOGRAPHY

### Report on Underwater Photography in Oceanographic Research

Research vessels are now making considerable use of underwater photography. No large oceanographic expedition sets sail without special equipment for automatic deep-water photography to reveal the secrets of the ocean and to learn more about its flora, fauna, and the geological character of the ocean floor. For example, great deposits of manganese concretions on the floor of the eastern and central parts of the Pacific Ocean at depths of 4 to 5 km were also discovered by means of photography.

It is interesting to note that the author concedes that the first successful photographs of the ocean floor by an automatic camera were taken by American researchers. The first photographs of the ocean floor made at great depths by Soviet researchers were made in 1953 from aboard the expeditionary vessel "Vityaz'."

Modern cameras for underwater use have an exceptionally large film supply which makes it possible to take up to 1,000 photos under water during each lowering of the camera. At depths greater than 100 meters it is almost completely dark; therefore the camera lens has no shutter. Highly sensitive panchromatic movie film is used. Many of the newest types of apparatus are stereoscopic cameras; they make it easier to interpret the resulting photographs and make it possible to measure various features on the ocean floor.

A powerful light source is needed, even to illuminate several square meters of the ocean floor. The flash bulbs used differ very little in principle from those used by news correspondents.

It is necessary to deal with immense hydrostatic pressures in this work -- 100 atmospheres at a depth of 1,000 meters, and 1,000 kg per square centimeter of camera surface at the greatest depths in the Pacific Ocean, in the vicinity of the Marianas. The camera must therefore be housed in a body of high-quality steel. The flash bulbs are made from plexiglass. The optic axis of the camera is usually inclined  $45^{\circ}$  to  $60^{\circ}$  to the surface of the floor, making it possible to take oblique photographs.

Modern underwater cameras are connected to the ship by a single steel cable. On lowering the camera it is very important to detect the precise moment when the camera comes in contact with the bottom. A very sensitive dynamometer is therefore attached to the cable winch. Although acoustic indicators have certain advantages, the author protests that they make the design of the camera much more complex.

The camera comes to rest on the bottom and is then raised several meters. The process is then repeated. At the moment when the camera touches bottom the flash goes off and a photo is taken.

Without elaborating on the matter, the author states that deep-water television will soon be a reality. ("Photoeye in the Depths of the Ocean," by N. Zenkevich, Yunyy Tekhnik, No. 9, September 1960, pp. 39-41)

Several New Underwater Contrivances Facilitate Oceanographic Work

The Journal Yunvy Tekhnik has recently carried descriptions and sketches of several interesting devices for underwater work. These devices were developed at the Institute of Oceanology of the Academy of Sciences of the USSR, in the electronics section.

One is a "mechanical arm," remotely controlled from aboard the vessel. This arm can grasp and remove various objects from the bottom of the ocean, attach a cable, cut metal, etc. The mechanical arm is supplied with a television "eye." The television receiver is installed on shipboard near the control panel. The arm has an electrohydraulic mechanism.

Another innovation is a magnetic bogie, which also carries a television camera. Use of this bogie makes it possible to inspect the underwater part of the hull of the ship when on the high seas. The bogie is remotely controlled from the vessel. The forward part of the bogie has a mechanism for cleaning the bottom of the vessel of various kinds of matter fouling the hull. It has electromagnetic wheels; the wheels and the steel hull form a closed magnetic circuit. ("Automatic Mechanisms Under the Water," by A. Abramov, Yunvy Tekhnik, No. 9, September 1960, pp. 10-11)

The "Severyanka" to Make its Sixth Voyage

The recently completed fifth voyage of the Soviet oceanographic research vessel "Severyanka" encountered unfavorable conditions for making underwater observations. The Barents Sea this year experienced an unusually early vigorous development of plankton and this made the water murky, hindering observations.

The researchers aboard the submarine also studied the structure of the floor of the sea and measured underwater illumination, transparency and distance of visibility.

The sixth scientific research expedition will be to the North Atlantic, to the area exploited by the Soviet herring fleet. The investigators will study the behavior of the herring and on the basis of these observations will develop new trawls for trawlers of modern displacement. Then the ships will not need to work throughout the year -- the annual quota will easily be filled in one or two months. ("Sixth Voyage of the 'Severyanka'," by O. Sokolov, Ogonek, No. 34, August 1960, p. 19)

Underwater Swimmers Aid Oceanographic Research

The Soviet research vessel "Persey-2" has been staffed by specialists from the All-Union Scientific Research Institute of the Fishing Industry and Oceanography. The current research team is headed by Nina Nikolayevna Romanova, Candidate in Biological Sciences. The

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mission of this group is to determine the number of young herring carried into the Barents Sea by the Gulf Stream and to make predictions of the possible catch in the years ahead.

The scientific staff was recently augmented briefly by a group of skin divers belonging to the Moscow Urban Section of Underwater Swimming. The members of this group spent their vacations aboard the "Persey-2" studying the flora and fauna of the Barents Sea.

The swimmers made important scientific observations, determining the presence of young fish, studying bottom relief and the general character of the sea floor, and observing the quantities and distribution of bottom organisms. They brought up specimens of various types for study by the specialists aboard the vessel and provided detailed reports on their underwater observations. ("In the Depths of the Barents Sea," by S. Stepanov, *Ekonomicheskaya Gazeta*, 20 October 1960, p. 4)

#### Another Research Vessel Makes its Maiden Voyage

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The following brief notice has appeared in *Ekonomicheskaya Gazeta*:  
The new Russian-built scientific research vessel "Miklukho-Maklay" left Odessa yesterday on its first voyage. It is outfitted with the most modern navigational instruments and possesses high sea-going characteristics. ("Day by Day," *Ekonomicheskaya Gazeta*, 30 September 1960, p. 1)

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#### The "Vityaz'" Sets Sail for the Indian Ocean

The following is the full text of a recent news dispatch appearing in *Izvestiya*:

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Odessa. 6 October. (TASS) The scientific research vessel "Vityaz'" of the Institute of Oceanography of the Academy of Sciences of the USSR today departed from the port of Odessa on its 33rd expeditionary voyage. It is heading for the Indian Ocean to conduct a wide range of oceanographic investigations.

The voyage will end in the middle of April in Vladivostok. The total length of the route is 27,000 nautical miles. The expedition will work in the Arabian Sea, the Bay of Bengal, the Andaman Sea and in the central part of the Indian Ocean. ("Events of the Day," *Izvestiya*, 6 October 1960, p. 6)

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#### Soviet Article Describes Oceanographic Research Aboard the "Mikhail Lomonosov"

A recent article in the Soviet periodical *Radio* carries considerable detail concerning the scientific work carried on aboard the "Mikhail Lomonosov," research vessel of the Marine Hydrophysical Institute of the Academy of Sciences of the USSR.

This vessel is now seeing its third year of service in Atlantic waters. It has 16 laboratories and a staff of about 70 scientific specialists. The ship carries the most modern radio navigational equipment, including radar. It carries a powerful radio transmitter which enables it to maintain constant contact with the Motherland from any part of the globe. Her various electronic and automatic instruments make it possible to make observations of rapidly changing and inter-related processes in the ocean and atmosphere. The staff engages in the correction of marine navigational charts, determination of the structure of the bottom of the sea, and investigation of its geological characteristics. The sounding devices on board are capable of measuring depths as great as 12,000 meters. Currents at the surface, and at some depth have been studied by special electromagnetic current gauges. Measurement of wave action is also done automatically. The periods and heights of the waves are measured with an automatic electronic potentiometer. A wide range of other instruments is mentioned briefly; these measure physical phenomena from the ocean floor to the upper layers of the atmosphere. ("Electronics Reveals Secrets of the Ocean," by M. Bogorodskiy, Radio, No. 7, 1960, pp. 7-9)

## VI. GRAVIMETRY

### Gravimetric Research: First Publication of a New Series

The expansion of gravimetric observations during the International Geophysical Year is reflected in the appearance of a new series of publications on Gravimetry, the 13th discipline of the IGY program, issued by the Interdepartmental Committee for the Conduct of the IGY under the Presidium of the Academy of Sciences USSR. The first in this series, titled Gravimetric Research (Gravimetricheskiye issledovaniya), contains the reports submitted by Soviet specialists at the Third International Symposium on the Study of Earth Tides which was held in Trieste (Italy) in July of 1959. ("Gravimetric Research. No 1" 1960, Moscow, Publishing House of the Academy of Sciences USSR; 62 pages)

## VII. SEISMOLOGY

### Some Notes Concerning the Pyatigorsk Seismic Station

The Pyatigorsk Seismic Station has just celebrated its fiftieth anniversary. It was originally founded on the initiative of Academician B. B. Golitsyn.

At first the station was engaged only in regular observations. Scientific research work began only after the October Socialist Revolution. Normal operation was interrupted by the last war, but the station was quickly restored and in 1951 it was completely reconstructed. New seismographs of the D. P. Kirnos type were installed (two horizontal and one vertical), plus many other forms of advanced apparatus such as a signal device for strong earthquakes and an instrument for the semiautomatic reception of time signals.

Between 1951 and 1959 the seismic station recorded 4,402 earthquakes, of which 197 occurred in the Caucasus and 174 were local, with foci within the area occupied by the Caucasus mineral water health resorts.

Data collected by the station for a catalog of local earthquakes in the Northern Caucasus covers the period from the IV century to the year 1958 and contains a listing of 2,172 earthquakes. ("Fiftieth Anniversary of the Pyatigorsk Seismic Station," by P. N. Nikitin, Vestnik Akademii Nauk SSSR, No. 9, 1960, p. 104)

VIII. GLACIOLOGY

New Expedition to Pamir Glaciers

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"The glaciological expedition of the Uzbek Academy of Sciences has again set out for the 'roof of the world'." The scientists are interested in the fact that many large Pamir glaciers have begun to live again and have suddenly increased in size. ("Events of the Day"; Izvestiya, 4 October 1960, p. 4)

## IX. ARCTIC AND ANTARCTIC

### Soviet Participant Describes Trek to South Pole

The Soviet publication Radio has carried an account of a trek to the South Pole during the course of the Fourth Soviet Antarctic Expedition.

The trek was from Mirnyy. It passed through Pionerskaya, Komsomol'skaya and Vostok to the pole. This is a distance of 2,700 km. The 1,280 km from Vostok station to the South Pole passed through completely unexplored areas.

"Khar'kovchanka" snow tractors were used. These machines, supplied with 600 HP diesel motors, weigh over 30 tons, are eight meters in length and four meters wide. All have special towing devices and each pulled up to 50 tons of various kinds of cargo. The train was equipped with the latest apparatus and mechanisms for glaciological research, drilling apparatus, a seismic station, and instruments for gravimetric, magnetic and meteorological observations. A large quantity of fuel, spare parts, and food was also carried.

The route between Mirnyy and Komsomol'skaya had already been subjected to thorough scientific investigation by earlier expeditions, so no research was conducted in that part of the trek. Part of the crew joined the expedition at Komsomol'skaya, having arrived by air.

At an altitude of three kilometers the atmospheric pressure dropped to 60 percent of normal. The thermometer read 68° below zero. This had an immediate effect on people's health. Of the seven scientists who had arrived from Mirnyy, four had to be evacuated at once.

The route from Mirnyy to Vostok has two exceptionally difficult sections. The first is near Pionerskaya and the second is between Komsomol'skaya and Vostok. Near Pionerskaya violent winds are almost incessant. Beyond Komsomol'skaya, on the other hand, the winds are weak and the snow surface is soft. Even such machines as the "Khar'kovchanka" bog down and become completely helpless. It required 23 days to travel 550 km from Komsomol'skaya to Vostok.

The train left Vostok for the South Pole on 8 December and arrived on the 26th. The group left on 29 December, arriving back at Vostok on 8 January 1960.

Radio communication was effected with aviation-type equipment -- a 70-watt RSB-70 transmitter-receiver. An aviation radio compass was used for navigation. Communication between units of the train was by small 10-watt receiving and transmitting sets operating on short wave. ("To the South Pole," A. Maksimov, Radio, No. 6, 1960, pp. 16-17)

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